



Pedelecs

Over the past few years, bicycles with electrical pedalling assistance, called Pedelecs (Pedal Electric Cycle) or e-bikes, have become increasingly popular. Up to 250 watts can be activated to assist in reaching speeds of up to 25 km/h. In addition, there are a wide variety of other electrical two-wheel devices in use in Germany and abroad, though these do not legally qualify as bicycles. Compared with a country like China, however, these other devices are not as popular in Germany.

The Pedelec works via an electrical motor that starts automatically when pedalling begins. Energy is supplied via a removable battery that is typically attached to the bicycle's frame or rack. The pedalling assistance can be switched on or off as needed.

The current market and distributors

In 2010, around 200,000 electrically-assisted bicycles were sold in Germany. In the year prior, 150,000 were sold, and sales have nearly tripled over the past four years. As an increasingly broad diversity of electrically-assisted bicycles enters the market, ever-more types of buyers are targeted. Nonetheless, these bicycles still only constitute approximately 5% of bicycles in use. For a Pedelec, buyers spent on average 1000 to 1500 Euros at high-end bicycle retailers, which means they make up a disproportionately large share of revenues.

Although the leading market for Pedelecs has thus far been in the Netherlands, Germany has hosted various regional and national pilot projects and is home to the

non-profit organisation Extra Energy, which is greatly investing in their distribution.

The Thuringian-based non-profit association Extra Energy supports the broader circulation and development of light-electric vehicles, including both Pedelecs and other, faster e-bikes. New Pedelecs models are tested twice a year, with results made available to the public. Furthermore, a quality seal for Pedelecs has been in use since 2002, helping to distinguish between the quality of various producers on the market. A track with curved, flat and steep sections is also available for customers to test the strengths and feel of Pedelecs.

Cover image: Special event at which new bicycle models are being tested. Charging Station in Salzburg. © ElectroDrive Salzburg

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With partners from Germany, Austria, Hungary, the Netherlands, the Czech Republic and Italy, Extra Energy has been part of the EU-project “GoPedelec!” since 2009. In an effort to improve energy efficiency, “GoPedelec!” offers test tracks in 5 countries at so-called “Road Shows”. Moreover, by supporting local pilot projects that address questions about charging stations, parking infrastructure, and the integration of Pedelects into bicycle rental operations, “GoPedelec!” ties local decision-makers into the project.

The potential of bicycles on long distance routes

Small-sized, electrically assisted vehicles have originally held the image of serving the elderly and physically feeble. However, Pedelects render steep slopes, head winds, long-distance commutes, and achieve higher speeds more easily for everyone. Increasingly, electrical assistance is being marketed towards use for longer-distance bicycle tours. In addition, use of electrically assisted bicycles for steep slopes is being piloted by projects in Tübingen (with university hospitals located at the top of the mountain), Stuttgart, Mecklenburg-Vorpommern (where Pedelec rental systems work in collaboration with local public transport), in the Chiemgau area, and in the Thuringian Sea region (where Pedelec rentals are used for tourist purposes).

A Dutch market analysis (TNO 2008) confirmed that electrically assisted bicycles permit coverage of longer distances, particularly for work commuters. On average, electrically assisted bicycles cover a distance of 9.8 km, while the average for regular bicycles lies at 6.3 km. Substituting use of the motor vehicle to cover such distances with electrically assisted bicycles could contribute greatly to climate protection.

Users of electrically assisted bicycles, including a large number of pensioners, indicated being able to ride more quickly and more frequently, and covering longer distances. They also reported using motor vehicles and bicycles less frequently.

Energy needs

Electrically assisted bicycles, in contrast to traditional bicycles, require electricity. An energy-needs ratio of 1:30 for electrically assisted bicycles as compared with motor vehicles, however, shows that every person

switching from using cars to using Pedelects more than compensates for a potentially large number of bicycle-users switching to Pedelects.

On average, the electrically assisted bicycle uses one kilowatt-hour of electricity per 100 km (equivalent to approximately one laundry load or seven hours of television). Naturally, the use of CO₂ depends on how electricity is generated. Depending on the method, the use of CO₂ lies between 4 and 14 grams/km (as compared with 180 grams CO₂/km for the motor vehicle).



Charging station in the Netherlands offered by a hotel. © Jörg Thiemann-Linden
Solar Bikeport in Bad Tölz. © Donauer Solartechnik Vertriebs GmbH

Further Information

Extra Energy (2011): www.extraenergy.eu [German]

Go Pedelec (2011): Homepage of the EU project: www.gopedelec.eu

Presto (2011): Homepage of the EU-project: www.presto-cycling.eu/de/pedelects

TNO Market Analysis: Hendriksen, Ingrid/Engbers, Luuk, et al. (2008): Rapport Elektrisch Fietsen. Leiden: <http://www.tno.nl/downloads/Rapport%20KvL-BG-2008-067s.pdf> [Dutch]

Infrastructural requirements: Parking and charging

For heavy and expensive electrical bicycles, burglar-proof and accessible parking facilities are critical (stairs should be avoided and flatly angled metal sliding grooves encouraged). While recharging can take place at home or at the workplace, parking is still a problem in other public places or at Bike & Ride parking lots at train stations.

In order to better guarantee sufficient battery charge, parking areas should, wherever possible, be combined with weather-proof charging stations. Alternatively, battery exchange networks can be established for electrically assisted bicycles with removable batteries, as is done near the Thuringian Sea. Public places where one tends to stay longer, such as at pubs, hotels or other recreational facilities, could serve as charging centres or as rental stations. In the Netherlands, online search engines for “hotspots” are already available for representatives of the tourism industry to post the locations of their charging stations online. The first prototypes of covered bicycle parking lots with charging areas are developing in public spaces. In Austria, similar projects are supported in the context of furthering climate protection – a strategy called “klima:aktiv mobil”. Meanwhile, in Satagaya, a borough of Tokyo, the first covered parking areas have been built, with solar panels on the roofs that provide electricity for Pedelec charging stations.

Do Pedelecs require alternative traffic planning?

Because of the higher speeds attained by electrically assisted bicycles, they do require more complex traffic systems including: sufficiently wide curves, clearer lines of sight at intersections and junctions, the possibility to pass slower-moving bicycles, and smoother road surfaces for longer distances.

In 2010, the German Road and Transport Research Association (FGSV) published a new set of rules which, in theory, addresses the needs of higher-speed Pedelecs (“Planungstempo 25”). However, in practice, limited compliance to these rules hinders the optimal use of Pedelecs. The construction of new bike paths on the same level as the sidewalk, constitutes a poor investment given the increasing use of Pedelecs. Signs indicating the use of narrow sidewalks for both bicycles and pedes-



A cycle street in Zwolle (NL) proves to be better than cycle paths for passing other cyclists. © Jörg Thiemann-Linden

trians, particularly in rural areas, will be increasingly problematic. Alternatively, cycling infrastructure such as an advisory lane on the carriageway is more suited for Pedelec use, as they enable cyclists to pass each other using the entire carriageway.

As Pedelecs are used to cover greater distances, the development of an infrastructure to better accommodate long-distance bicycle commuters is needed (such as new direct cycling routes, and uninterrupted parallel tracks for commuters). Especially well-suited for Pedelecs are cycle freeway projects that lead directly into the city centres and target high speed commuters. Such networks support the growth of bicycle mobility, and are already being implemented in a number of European countries, notably in the Netherlands. On occasion, they are also available to other high-speed electrically powered two-wheel vehicles with special regulations (such as minimum user age, license plate, and helmet requirements). The use of such networks by these high-speed vehicles is only possible if pedestrians are given enough space so as not to be disturbed, or if pedestrian routes are altogether separate.

New services – a boost for tourism

Pedelecs play an instrumental role in the current bicycle boom in the tourism sector. Competition between various tourist destinations and operators, and tourist marketing are all impacted by the availability of Pedelec rental. The MOVELO network, operating in a number of regions, has already implemented service grids with rental and battery-exchange stations, principally at hotels. Such initiatives widen the area in which tourists

Zweirad-Industrie-Verband (2011): Deutscher E-Bike-Markt wächst weiter:
www.nrvp.de/neuigkeiten/news.php?id=3210 [German]

More Information on Pedelecs can be found in the following editions:
Cycling Expertise A-4 Climate Protection through Cycling
Cycling Expertise I-5 Bicycle Parking in the City Centre
Forschung Radverkehr I-4 Radschnellwege [German]
Forschung Radverkehr S-1 Betriebliches Mobilitätsmanagement [German]

can operate, whether on smaller excursions, on vacation or during entire holidays on bike.

The Swiss have recognized the potential of electrically assisted bicycles in the tourism industry and are exploiting it to its fullest: the NGO “SwissMobile” (“Schweizmobil”), which aims to coordinate and further bicycle and pedestrian traffic, has proclaimed “Veloland Schweiz” (“Cycling Country Switzerland”). On offer are various national, regional and local cycling routes, maps and guides, as well as overnight stays at partner hotels and hostels – also available to Pedelec-users. An interactive map shows the entire rental network system in Switzerland. Over 500 battery charging stations permit battery exchanges at no cost.



Restaurant businesses and battery exchange stations along a Pedelec route in Switzerland. © Appenzellerland Touristik

In Germany, Pedelec rentals are entering the market particularly in hilly regions: in the Thuringian Sea area, Pedelec rental networks cover an area of 1000m², via stations at hotels, restaurants and pubs, and bicycle repair stores. In the Chiemgau region, the tourist industry has built the Pedelec into a bigger concept, with bus shuttle service and tickets, which can be used for Pedelecs

in the same way as for bicycles. The marketing strategy for this region targets various groups and interests, and has on offer all-inclusive packages including overnights stays, bicycle or Pedelec rental, and sight-seeing opportunities.

Many unanswered questions

The relatively new concept of Pedelecs in mobility research and traffic planning is still in its beginning phases, and many questions have arisen that need yet to be answered:

Will the increased use of Pedelecs impact traffic accidents, and how will road safety priorities have to shift as a result?

How might train stations be upgraded to accommodate Pedelec parking (for example, via small lockers to store the expensive batteries)? Fire safety concerns resulting from the storage of large numbers of electrically-assisted bicycles and their batteries remain unclear.

Will the Pedelec be shared by entire households (and potentially substitute a second car) or will it most often be used by one person, as has been true for the traditional bicycle?

How will the market for electrically assisted three-wheel bicycles continue to develop (for going shopping with children, for example), and how will the increased use of such bicycles impact the need for parking in densely populated areas?

The impact on health also remains unclear. On the one hand, the use of Pedelecs increases exercise as compared with the use of motor vehicles, thanks to the continuous motion applied over long distances. Thus, regular exercise is built into the daily rhythm. On the other hand, the use of the Pedelec may have the opposite effect on segments of the population currently using traditional bikes, such as among young people.



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